Title: Bar Graphs

Brief Overview:

In these hands-on lessons, students will review what they know concerning pictographs, collect data, and display that data through the creation of tables and bar graphs. Students will gain skills and build confidence in the creation of bar graphs by progressing sequentially through these three lessons. The lessons have been designed to move students from a concrete application to an abstract application. The ultimate goal is to assess the student's academic progress through the completion of these activities. The prerequisite skills required for maximum student achievement include prior experience with counting, sorting, transferring data to a table, and transferring data from a table to a graph.

NCTM Content Standard/National Science Education Standard:

Data Analysis and Probability

Grade/Level:

Grades 2 - 3

Duration/Length:

3 Days (50 min. each day)

Student Outcomes:

Students will:

- collect and organize data.
- collect data in tables.
- organize and display data to make a single bar graph
- analyze data by interpreting data contained in tables
- interpret data contained in single bar graphs by using a variety of categories and an interval of 1.

Materials and Resources:

Visuals

- Overhead Projector/Transparencies

Manipulatives

- Pasta (multi-colored and multi-shaped)
- Multi-color connecting cubes (1 bag per child)
- Crayons
- Container of Buttons

Other Resources

- Teacher and Student Resource Sheets RS1-RS26
- Read-Aloud Book The Button Box by Margaret S. Reid
- Clipboards (1 clipboard per student)

Development/Procedures:

Lesson 1 – Buttons, Buttons, and More Buttons

Preassessment –

- Bring in a container containing a variety of buttons.
- Have students form a circle on the carpet.
- Remove the buttons from the container and place them in the center.
- Solicit responses from students as to what they could do with the buttons. (Teacher is looking for responses such as count them, sort them into groups, organize them, graph them, etc. Teacher should also look for the use of correct vocabulary related to sorting and graphing.) Write these responses on the board or on chart paper.
- What do you notice about these buttons? (Teacher is looking for responses related to color, texture, size, number of holes, shape, etc.) Write these responses on the board or on chart paper.

Launch –

- You may continue with students on the carpet or have them return to their desks.
- Teacher will read The Button Box, by Margaret S. Reid as a way to introduce the concept of sorting and classifying data.
- Elicit responses from students regarding the different ways the buttons in the book are sorted. (Teacher note: In the book, the buttons are sorted in the following ways: painted, sparkly, covered with cloth, metal, from old shoes, from uniforms, pearly ones, number of holes, texture, shape.)
- Did the boy in the story sort the buttons the same way we did or did he find new ways to sort them?
- Why is sorting important? Sorting is important because it helps students look for similarities and differences in data. This is an important skill as they begin to solve higher level problems and questions and need to look for connections in the data being presented.

Teacher Facilitation –

- "I too have a button box where I keep my special and most favorite buttons; but I forgot to bring it to class with me today. I do, however, have a table that shows you how I have classified some of my buttons." (Display RS-1) Take a few minutes to discuss the tally marks, what they represent, and what the table shows.
- I also have another way to display the information about my favorite buttons. Display a transparency of RS-2 (pictograph). Ask students to explain what it is and how it relates to the data in the table.
- Be sure to emphasize the important parts of all graphs (title, labels, axis, and pictures) along with the correlation of the table to the pictograph.
- Give students time to review the pictograph. Is there another way I could have sorted this data? (You are looking for ideas such as size, shape, texture, color, etc.)

- Is there another graph that we could create using the same data as we used in the pictograph?
- Bar graph – a graph of data with parallel bars for comparing information. (Display vocabulary card on board RS-3)
- Make a transparency of RS-4. Use this transparency in order to create a bar graph of the button data as a class. (It is important to have students assist in the creation of the bar graph.) Discuss the important parts of a graph and have students add this information to the transparency. (See completed graph RS-5, for teacher use.) Again, reinforce the components of title, axis, increments (numbering), labels, and spacing. (TAILS – title, axis, increments (numbering), labels, spacing)
- Questions: What type of buttons do I have the most of? What type of buttons do I have the least of? How many more 4-hole buttons do I have than 2-hole buttons? How do you know? How many buttons are in my special button box?

Student Application –

- Distribute individual bags of connecting cubes to each student. (Red – 3, Blue – 8, Yellow – 4) You may choose to differentiate based on ability levels by having different numbers of cubes in the bags.
- Instruct students to take out the contents of their bags and sort them. Encourage students to give ideas as to how the cubes should be sorted.
- For this activity, students will sort the cubes by color and complete a table (RS-6) using their data. Students will then use the data from the table to complete their bar graph (RS-7). (Teacher note: If you have differentiated your bags, see RS-8 or RS-9 for additional graph templates.)
- Teacher will circulate around the room observing student progress. Look for the correct number of items in the table compared to their data; a one to one correlation between the data in the table and the data in the graph; graph completed correctly. Questions to ask: How did you know what the labels for the horizontal axis should be? What did you do first when you started completing your graph? Why? What do the numbers on the vertical axis represent?

Embedded Assessment –

- Questions on RS-10 related to the table and graph will serve as an assessment for the teacher.

Reteaching/Extension –

- Reteach: Have students actually place their cubes on the grid paper in order for them to visually see a one-to-one correspondence between the data and the graph.
- Extension: Journal prompt: Choose one object from the list below and describe how you could sort this data. Be sure to include specific examples.

  shoes books sports TV shows computer games

Lesson 2 - Pasta! Pasta!

Preassessment –

- Teacher will display a transparency of a graph with missing elements (RS-11/Teacher).
- Students will identify missing parts and briefly describe the function of each part and explain why that part is essential in creating a graph.

Launch –

- Divide students into groups containing 4 to 6 students (number of students in groups will vary based on classroom size).
- Teacher will instruct the students to sort their group by 1 variable. For example, students may choose to classify themselves into groups by gender, eye color, type or color of clothing, hair color or length, eyeglasses or no eyeglasses, or height (short or tall).
- Teacher will monitor student responses within groups to decide if students understand the concept and to provide assistance if necessary.
- Teacher will select a group of students to stand in front of the classroom and the remaining students will explain how the students in that group organized themselves.

Teacher Facilitation –

- Teacher will distribute bags of multi-colored pasta to each student. Each bag will include (4-red, 7-blue, 2-green, and 9-purple).
- Teacher will guide students to sort pasta by color. Teacher will ask students to explain to the teacher a step-by-step procedure as to how the class can organize the data. For example, the teacher might ask the students "what is the first thing we need to do in order to organize our data?"
- Teacher will use chart paper to record students responses and create a table.
- Teacher will explain to students how we will use the data from our table to create a bar graph as a class.
- Teacher will display a grid transparency of RS-12 on the overhead projector and randomly select students to add the necessary components to the graph to properly complete it.
- Teacher will engage students in a classroom discussion using the following questions:
    - How many red pastas are there? Blue? Green? Purple?
    - Which color had the most amount of pasta?
    - Which color had the least amount of pasta?
    - How many more purple pasta than blue pasta?

Student Application -

- Students will work with a partner to sort the pasta in a different way such as size, shape, texture, etc.
- After they sort the pasta, the children will transfer the data to a table (RS-13).
- Once the table is completed, students will transfer the data from the table to a bar graph (RS-14).
- Students will complete their own worksheet.
- Teacher will circulate to assess student's understanding of concepts presented in this lesson.

Embedded Assessment –

- Student will answer questions based on how they choose to sort their pasta (RS-13 includes table and questions).

Reteaching/Extension-

- Reteaching: Teacher will work with a small group of students to assist them in choosing another way to sort the data. Students will use a table to show a different method of sorting. Students will then physically place pasta on the bar graph to reinforce visual understanding of the one to one correlation between data and the graph (Use RS13 and RS-14).
- Extension: Students will be presented with 3 groups of data. Students will have to determine what group of data matches with the bar graph (Use RS-15 and RS-16)

Lesson 3 – What's In Your Name?

Preassessment –

- Display transparency of bar graph RS- 17 on the overhead. Distribute "Jumping Jelly Belly Beans," RS-18 to students. This worksheet contains five questions that students will answer related to the bar graph. Discuss answers as a group.

Launch –

- Have students predict the most popular number of letters in students' names in our class. We will check our predictions at the end of class by completing an activity. (Teacher note: Relate the prediction process to the science skill of making a hypothesis and then conduction an experiment to prove or disprove your hypothesis.)

Teacher Facilitation –

- Discuss with students: Mrs. Duva's class recently conducted a survey regarding who had birthdays in which months of the year. I have a copy of that survey. (Display RS-19) (Note to teachers: Change the teacher's name to one that is representative of your school.)
- Discuss what observations the students can make from the data in the table. (Things to look for include: some months do not have any data, August has the most birthdays, it is difficult to tell what months have the same number of birthdays when the information is listed in a table, etc.)
- What could Mrs. Duva's class do with the data they collected? (You are looking for students to say – create a bar graph because it would make the data easier to read.) They did in fact create one and I happen to have a copy of it. See RS-20. Display the transparency.
- The bar graph will have several mistakes in it. See if students can locate them as you discuss the correlation between the information in the table and the creation of the graph. Mistakes include (1) title that doesn't match the data being surveyed; (2) data for the month of March doesn't agree with the number in the table; (3) two months are out of order; (4) two numbers on the horizontal axis are out of order; (5) the data for December is missing from the graph.

Student Application –

- Instruct students that they will now conduct their own survey to determine the number of students that have the same number of letters in their first name.
- Distribute a post-it note to each student. They are to write their name on it and below their name they should write the number that corresponds to the number of letters in their first name. Students will place post-it notes on their desks. All students will then receive a clipboard and worksheet on which to record their data. (Use RS-21for students) Students will walk around to each desk in order to obtain the information they need. They will place a check mark in the appropriate box on their worksheet to represent the number of letters in a student's name. Teacher needs to circulate around the room as students are collecting data to assess understanding and correctness of completing worksheet.
- After all of the data has been collected, students will work cooperatively with a partner to complete a bar graph and answer questions based on the results of their survey. (Use RS-22 and RS-23). Teacher will continue to circulate around the room and assist students and assess understanding of application.

Embedded Assessment –

- Questions on RS-23 will be used to assess understanding of the application.

Reteaching/Extension –

- Reteach: Have students use manipulatives to reinforce the one-to-one correlation between the data in the chart and the bar graph.
- Extension: Journal Prompt: Choose another way in which to sort the data contained in your worksheet. Create a table to show your new sort.

Summative Assessment:

The summative assessment for these three lessons consists of a completed bar graph that students will use to answer five questions. The questions contain multiple choice, short answer, and a brief constructed response. (See RS-24 and RS-25, answer sheet can be found on RS-26). The teacher will be able to assess student's understanding of the concepts presented.

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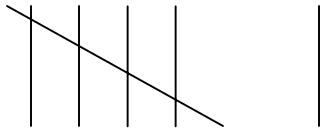
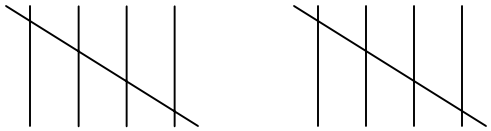
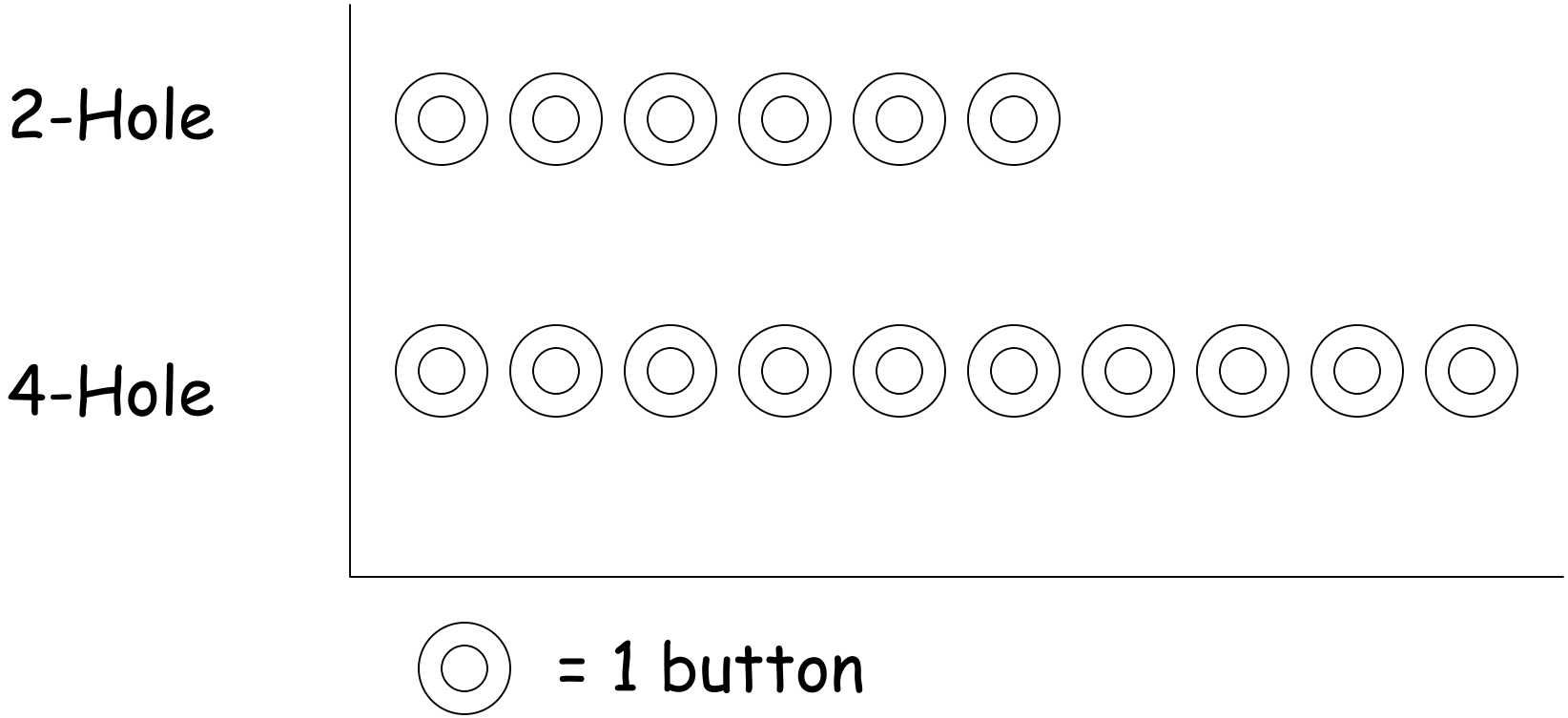
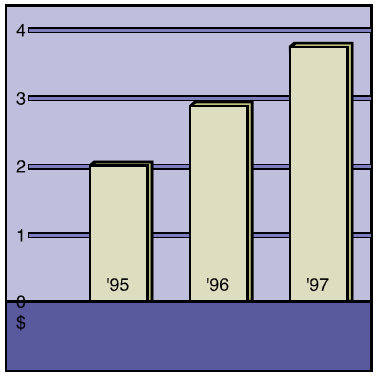
FAVORITE BUTTONS

Type of Button	2-Hole	4-Hole
Number of Buttons		

FAVORITE BUTTONS



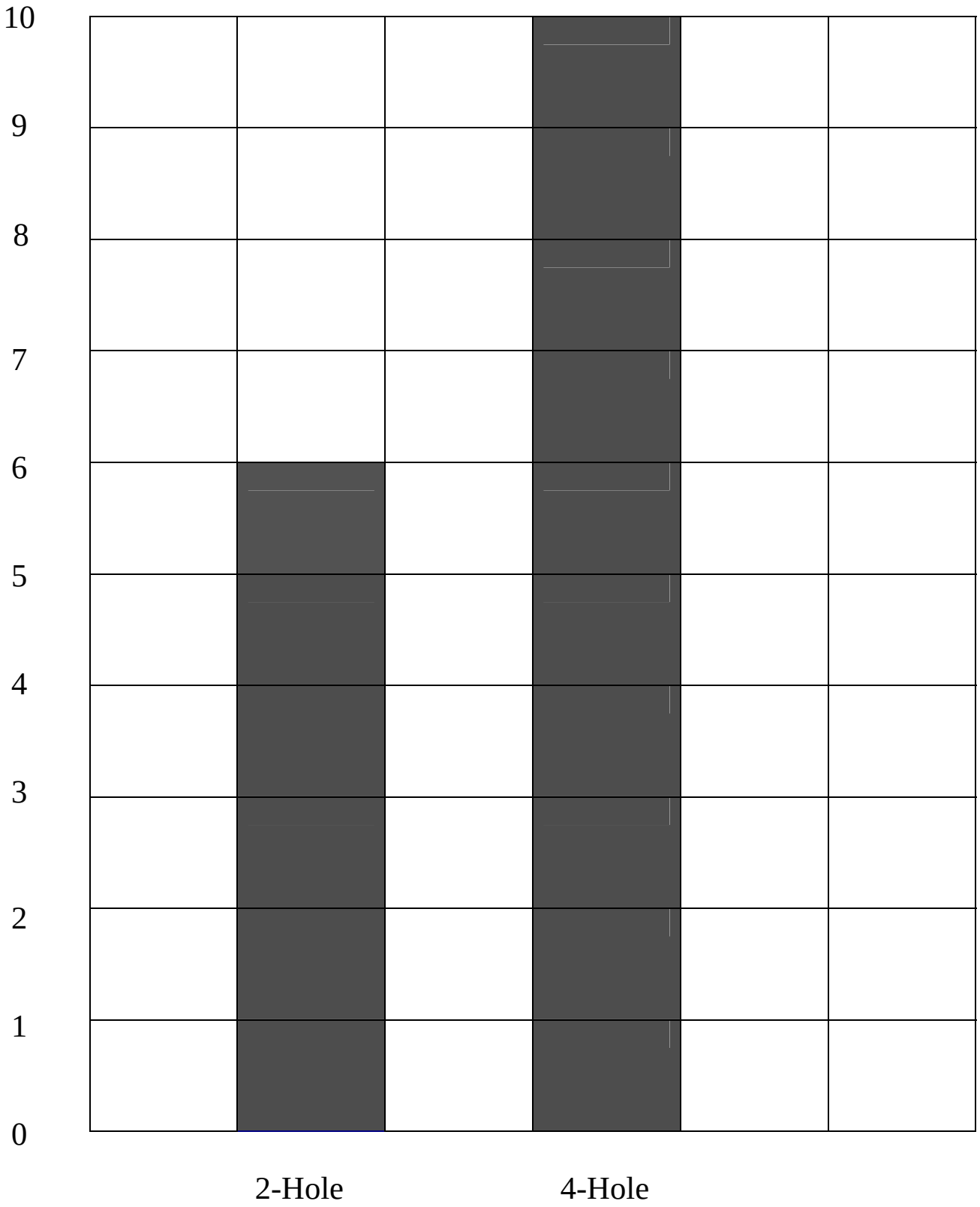
Bar Graph:



A graph of data with parallel bars for comparing information

Bar Graph Template

Favorite Buttons

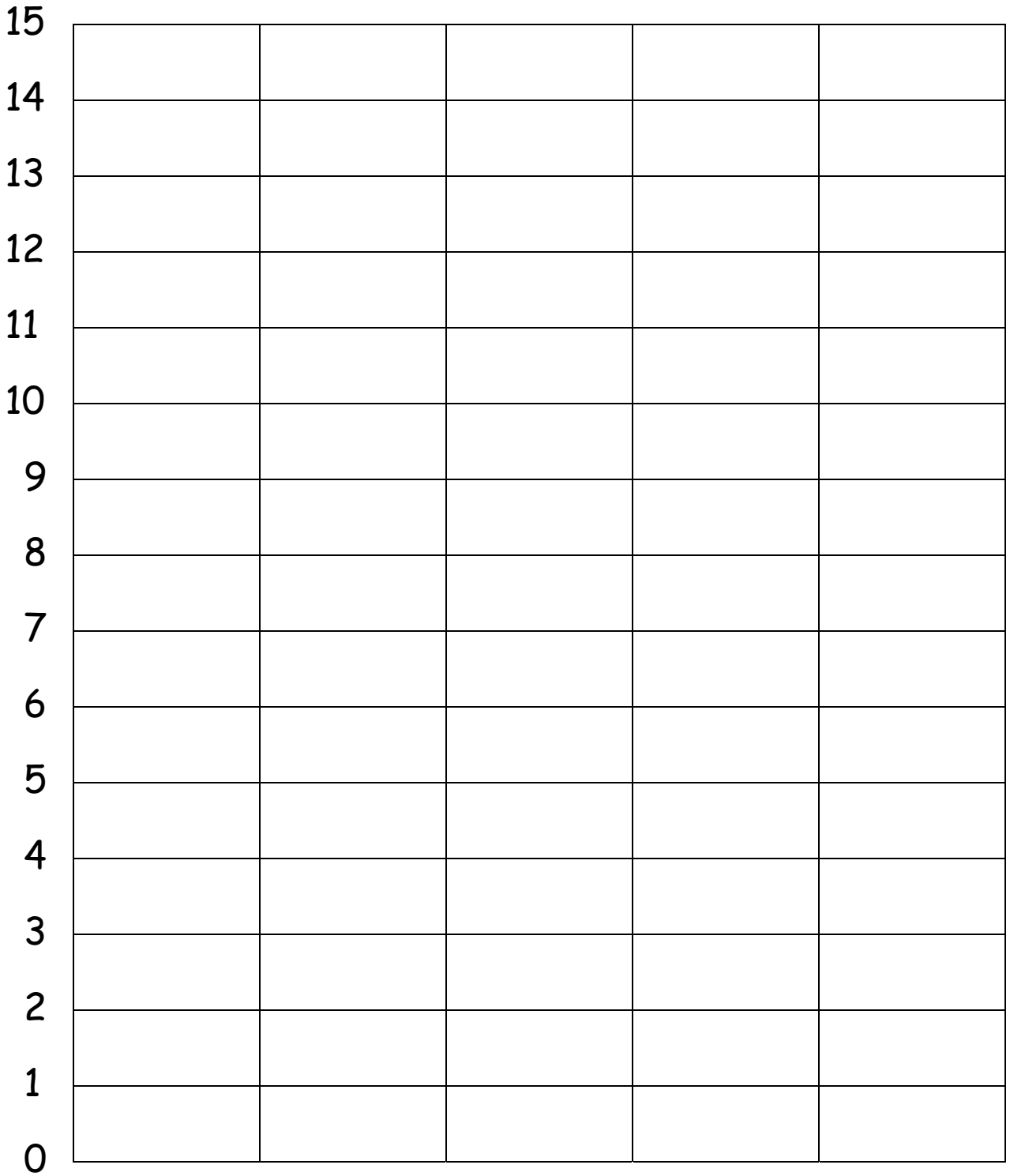


Connecting Cubes

Color	Red	Blue	Yellow
Number of Blocks			

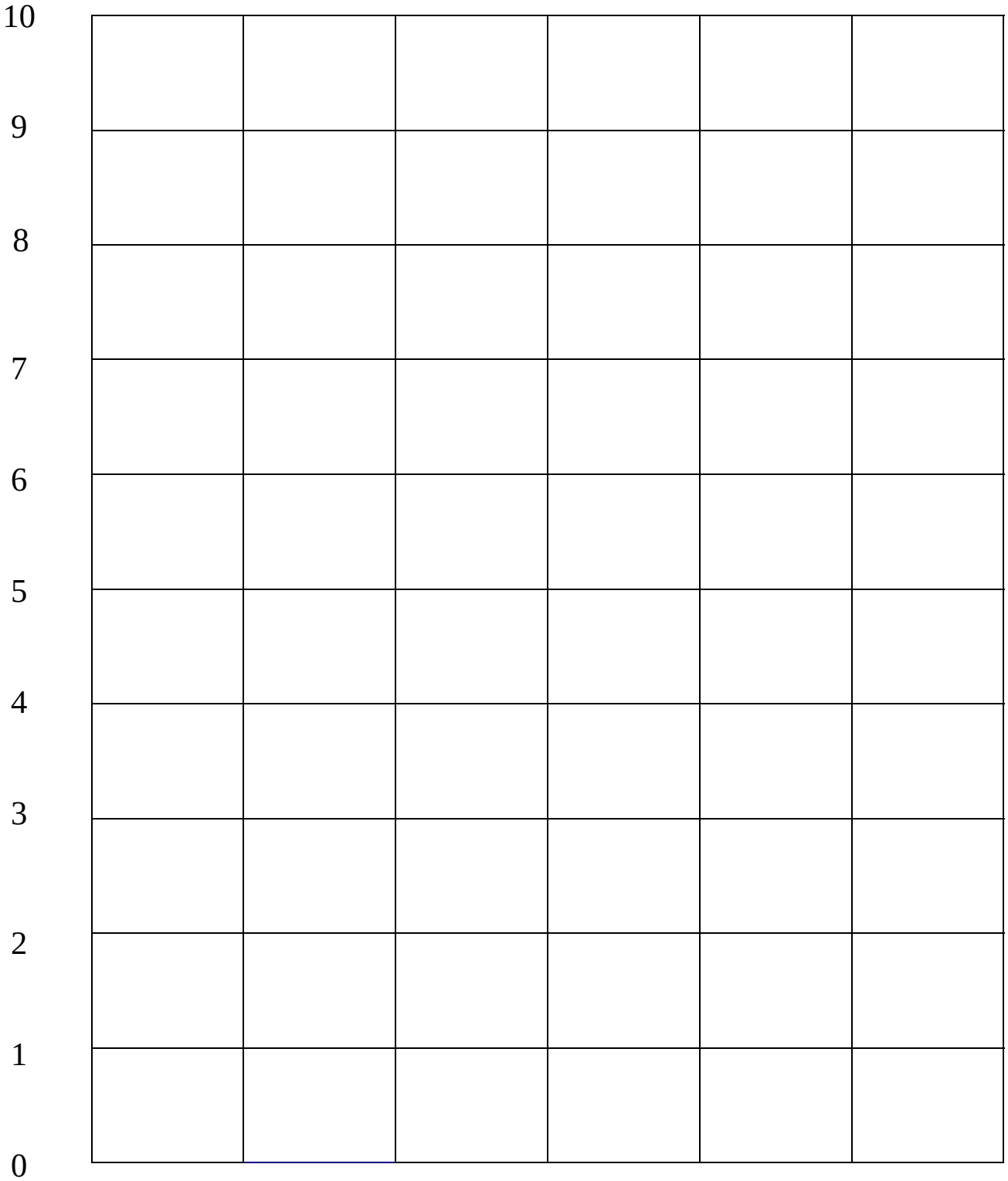
Name _____

_____



Name _____

_____



Name _____

Name _____

Connecting Cubes Questions

Use the information in your table and graph to answer the following questions. Make sure your answers are in a complete sentence.

1. What color cubes did you have the most of?

_____

_____

2. What color cubes did you have the least of?

_____

_____

3. Write a number sentence to show how many more blue cubes you had than yellow cubes.

_____

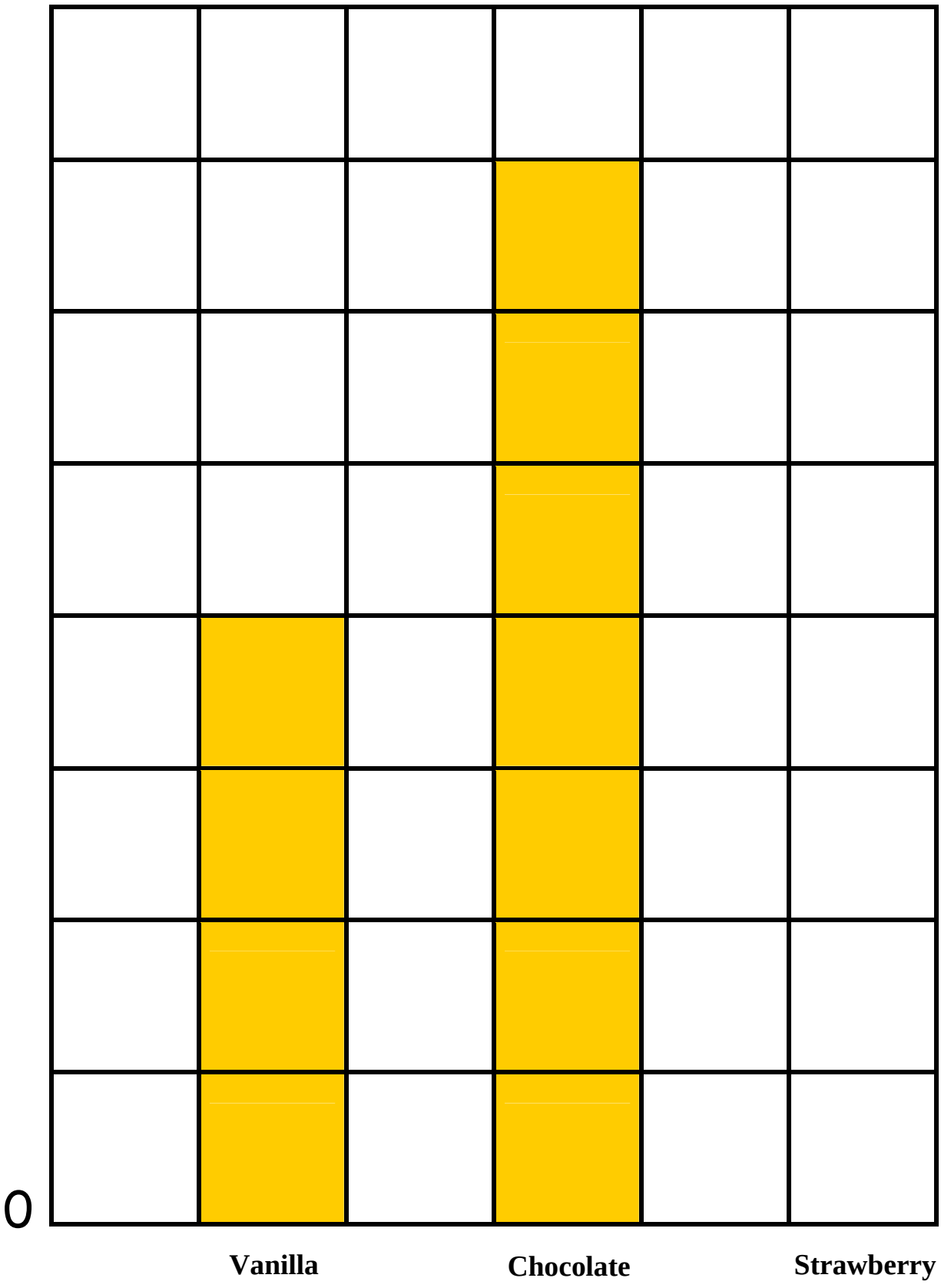
4. How do you know that the data in your bar graph agrees with the data in your table? Explain your answer.

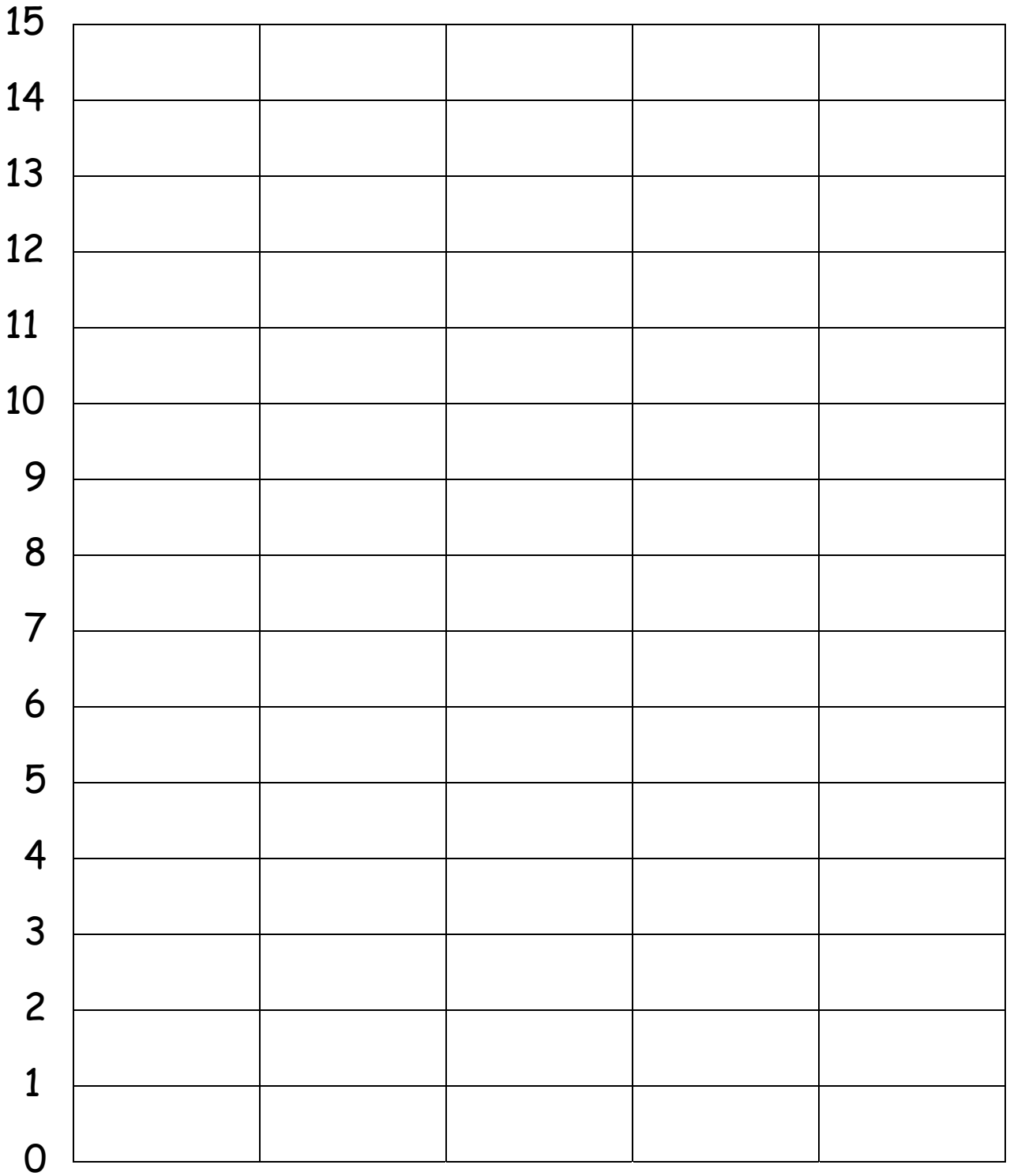
_____

_____

_____

Name _____

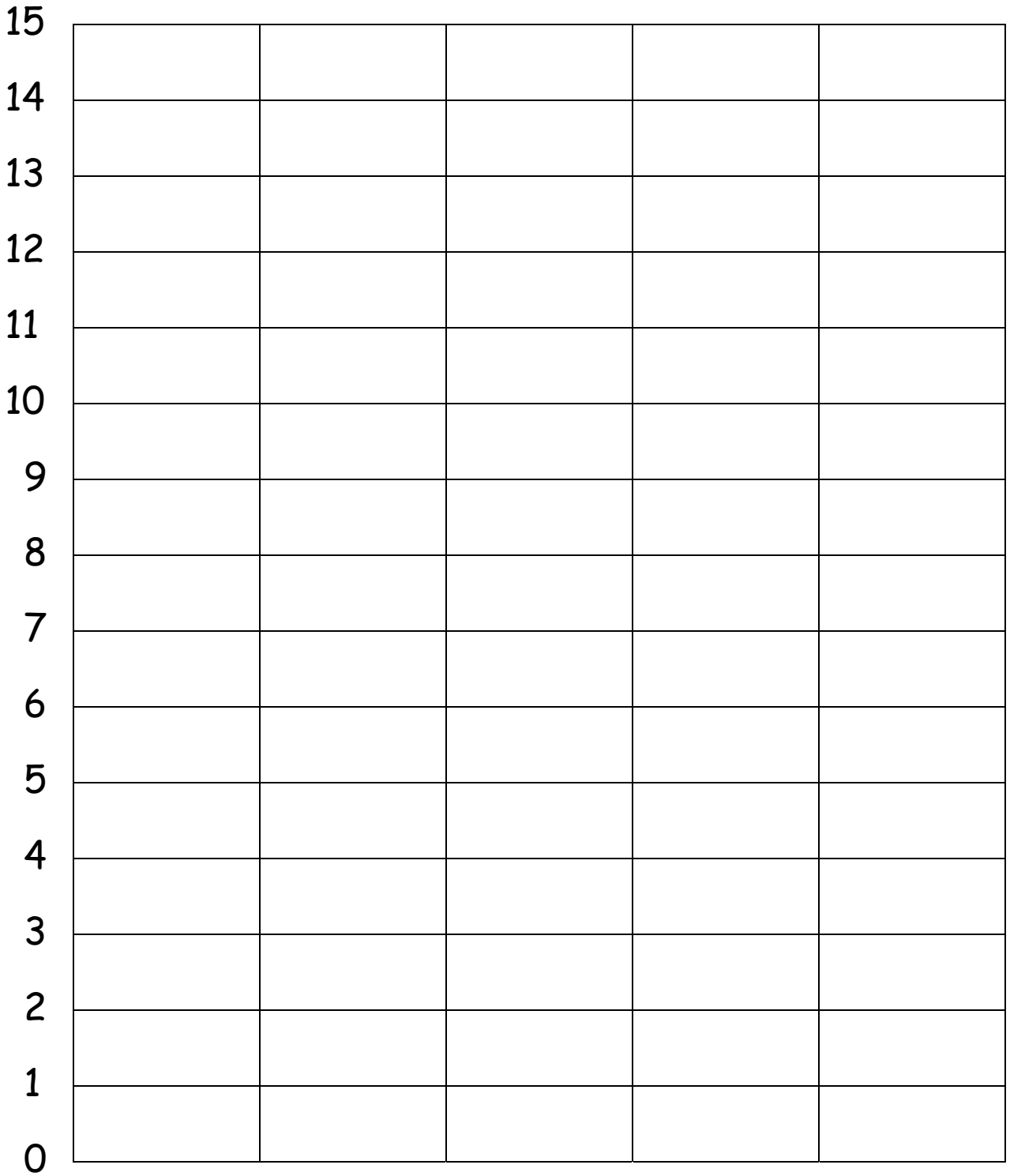

0
Vanilla
Chocolate
Strawberry



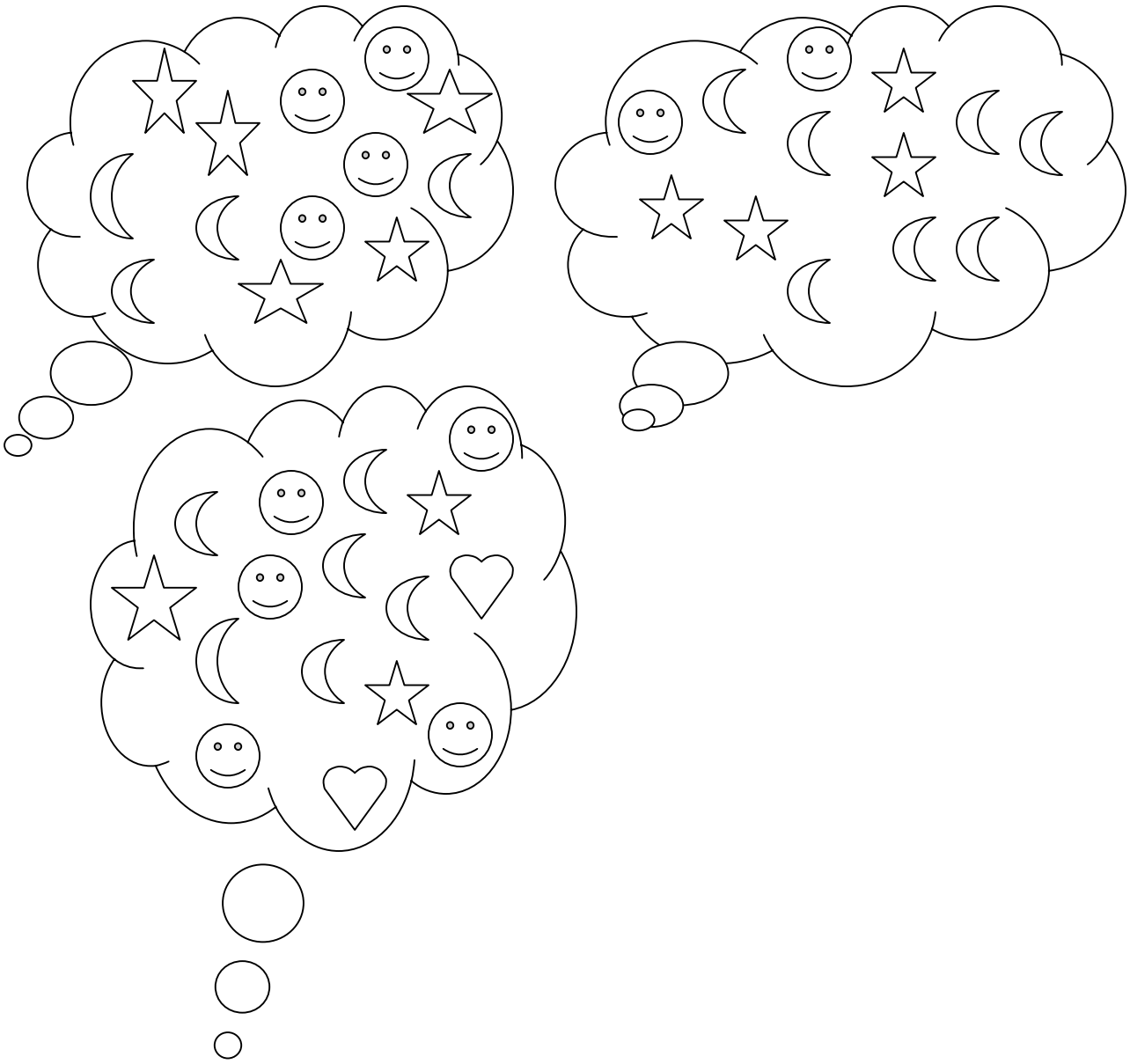
Name _____

Pasta!
Pasta!

Color Of Pasta	Red	Blue	Green	Yellow
Number Of Pasta				



Name _____



Use the bar graph to answer the following questions.

1. Choose the cloud from above that matches the data on the bar graph. Color the objects in that cloud.

2.Explain how you got your answer to #1.

_____

_____

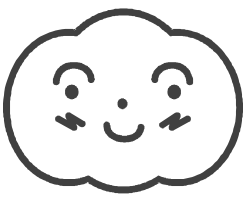
_____

Stars, Moons, and Smiles

10
9
8
7
6
5
4
3
2
1
0

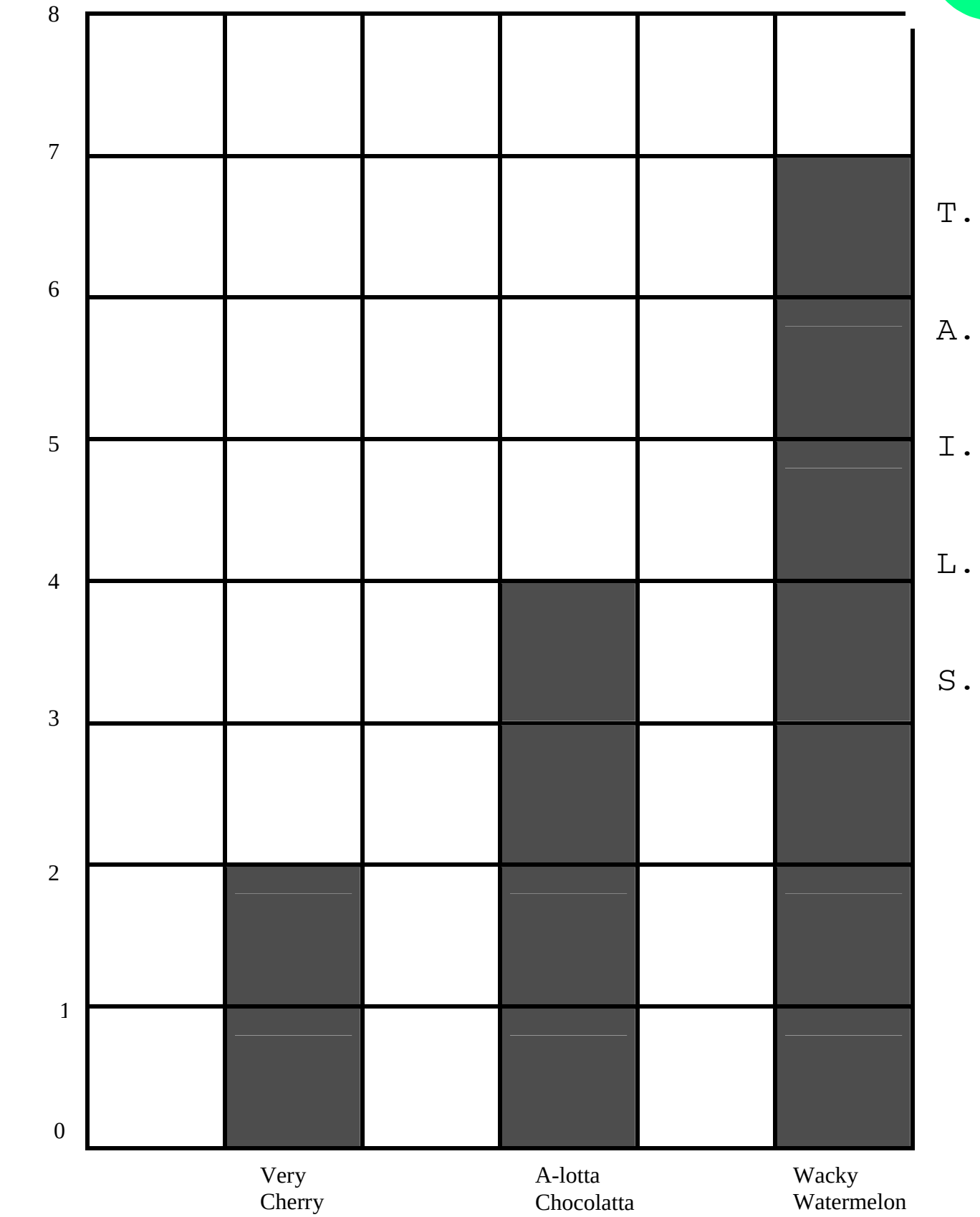
Stars

Moons



Smiles

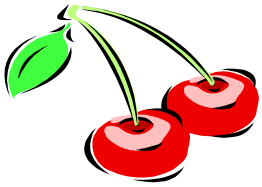
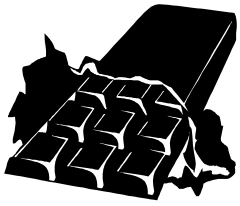
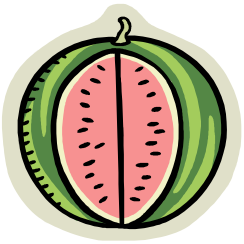
Jumping Jelly BellyBeans



Crazy Flavored Jumping Jelly Belly Beans

Jumping Jelly Belly Beans

***Directions: Use the bar graph to complete the table and answer the questions.**

Crazy Flavored Jelly Belly Beans	Very Cherry 	A-lotta Chocolatta 	Wacky Watermelon 
Number of Jelly Belly Beans			

#1 What is the total number of jelly beans in the bag? _____

a. Write a number sentence to show the total number of jelly beans in the bag?

_____

#2 Which flavor has the most amount of Jelly Belly Beans?

_____

#3 Which flavor has the least amount of Jelly Belly Beans?

_____

#4 Give another name for this bar graph.

_____

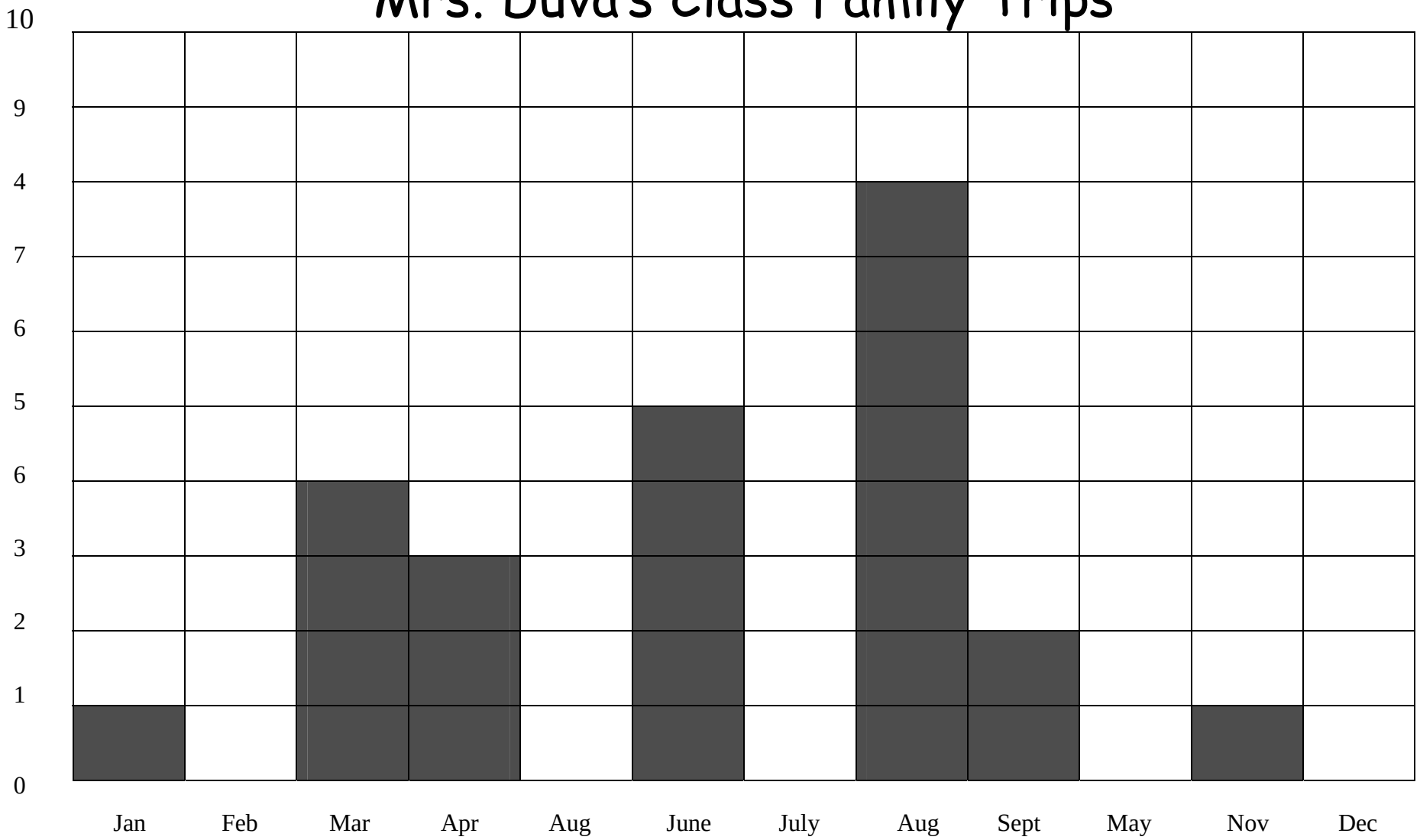
Name_____

Date _____

Mrs. Duva's Birthday Survey

Birthday Month	Number of Students
January	1
February	
March	2
April	3
May	
June	5
July	
August	8
September	2
October	
November	1
December	2

Mrs. Duva's Class Family Trips



Student Name	3-letters	4-letters	5-letters	6-letters	7-letters	8-letters	9-letters	10-letters	11-letters	12-letters	13-letters	14-letters
Totals												

Name _____

0

Name _____

Number of Letters in Our First Name

1. To find the number of students with 5-letter names, you

   Ⓐ add up the bars for any three columns.

   Ⓑ subtract 3-letter names from 8-letter names.

   Ⓒ look at the column for 5-letter names and find the number at the top of the bar.

   Ⓓ go to your table and count all of the letters in every student's name.

2. How many letters do most of the students in our class have in their first name?

_____

3. How many letters are in your name?

_____

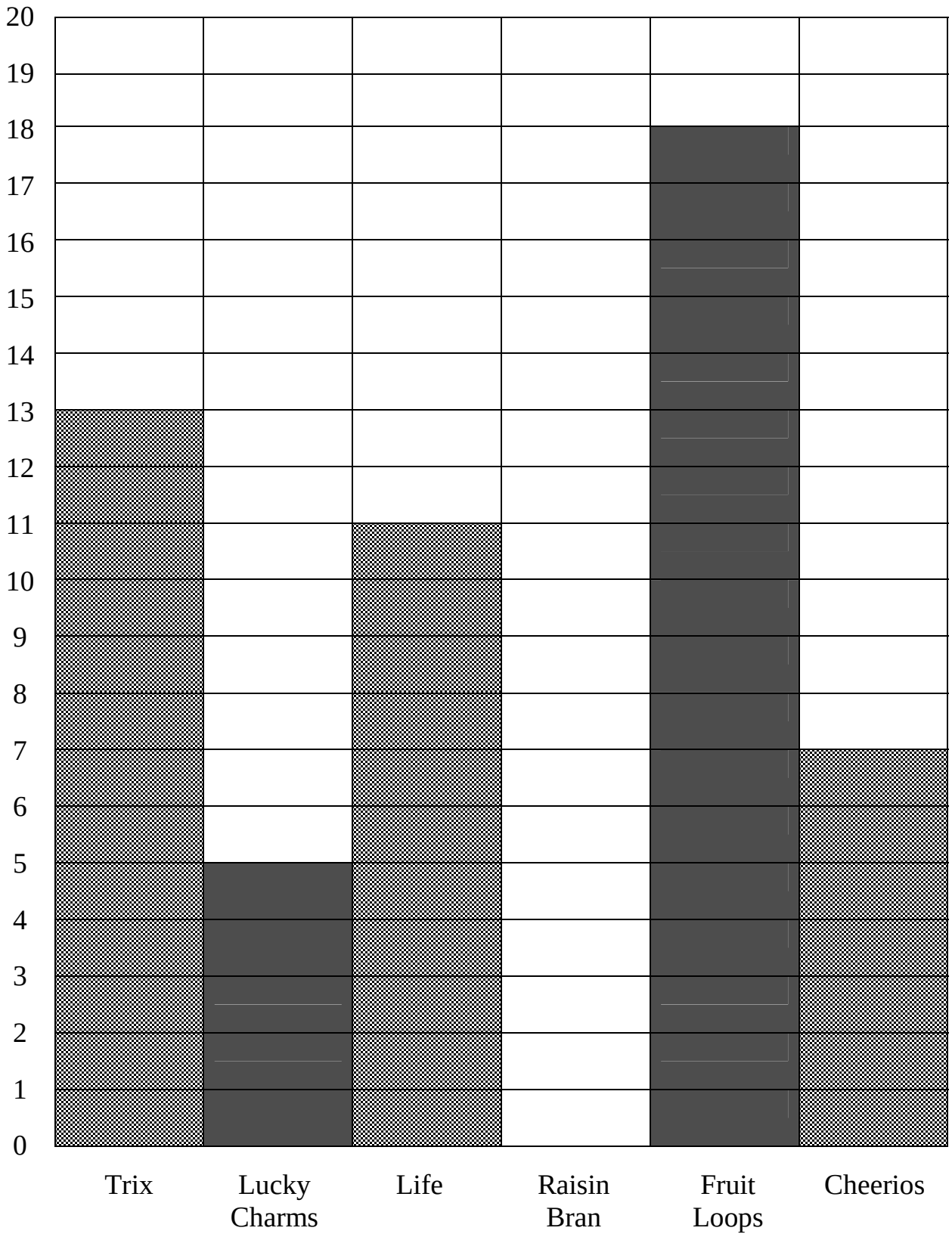
4. Do you think the graph would be different if we used last names rather than first names? Explain your answer.

_____

_____

_____

Name _____


20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
Trix
Lucky Charms
Life
Raisin Bran
Fruit Loops
Cheerios

Name _____

Name _____

Date _____

Summative Assessment

Directions: Use the bar graph to answer the following questions.

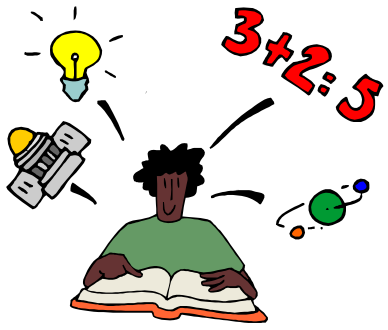
1. To find the total number of students in the survey, I would
   - Ⓐ add up any three bars in the bar graph.
   - Ⓑ subtract the most amount of cereal from the least amount of cereal to get the total
   - Ⓒ add up all of the bars in the bar graph.
   - Ⓓ add all of the numbers on the vertical axis.

2. What cereal do the students like the most?

_____

3. What cereal do the students like the least?

_____



4. What does it mean if a label on your graph does not have a bar colored above it? Write your answer in a complete sentence.

_____

_____

_____

5. Which title would you be more likely to use to describe this bar graph?

Ⓐ Goldilocks and the Three Little Gummi Bears

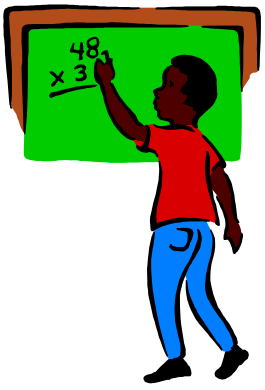
Ⓑ Which Cereal is the Best?

Ⓒ I don't like cereal!

Ⓓ Froot Loops vs. Lucky Charms

Good Luck and Always Remember to …..

DO YOUR BEST!



Name _____

Answer Key

1. Ⓒ
2. Froot Loop had the most votes.
3. Lucky Charms had the least votes.
4. Sample answer: If there is no colored bar above the label, that means no one voted for that particular cereal.
5. Ⓑ is the appropriate answer. The answer cannot be Ⓐ because the title is not related to the data on the bar graph. The answer cannot be Ⓒ because the children are voting for the cereal they like the best. The answer cannot be Ⓓ because the data is based on more than 2 cereals.